



J. E. Hall

United States
Department Of The Interior
Bureau Of Land Management
Region III
Missouri River Basin Investigations

PRELIMINARY
LAND PLANNING AND CLASSIFICATION REPORT
as Relates to the Public Domain Lands
in the



ANGOSTURA AREA
(UPPER CHEYENNE RIVER BASIN)

(Wyoming, Nebraska and South Dakota)

June, 1950

(For Administrative Use Only)

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This report was compiled in connection with the program
of the Department of the Interior for the Development
of the resources of the Missouri River Basin.

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DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
REGION III

(MISSOURI RIVER BASIN INVESTIGATIONS)

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(Upper Cheyenne River Basin
in
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ACKNOWLEDGMENTS

The general information in this report is largely a recompilation of pertinent data gathered from many sources and brought together for the purpose of presenting a picture of the land use economy and physical characteristics of the Angostura area as they relate to the public lands.

The principal sources of information include: records of land status obtained from the Bureau of Land Management, the U. S. Forest Service, and official county and state records; published and unpublished reports, manuscripts, records and preliminary findings regarding present and proposed irrigation developments from the U. S. Bureau of Reclamation, the Geological Survey, Production and Marketing Administration, Soil Conservation Service; Land use development and conservation program and Bureau of the Census, U. S. Department of Commerce reports; maps and records of the U. S. Forest Service, Soil Conservation Service, Production and Marketing Administration Bureau of Mines, Bureau of Agricultural Economics, Bureau of Chemistry and Soils, Extension Service and cooperating State agricultural colleges.

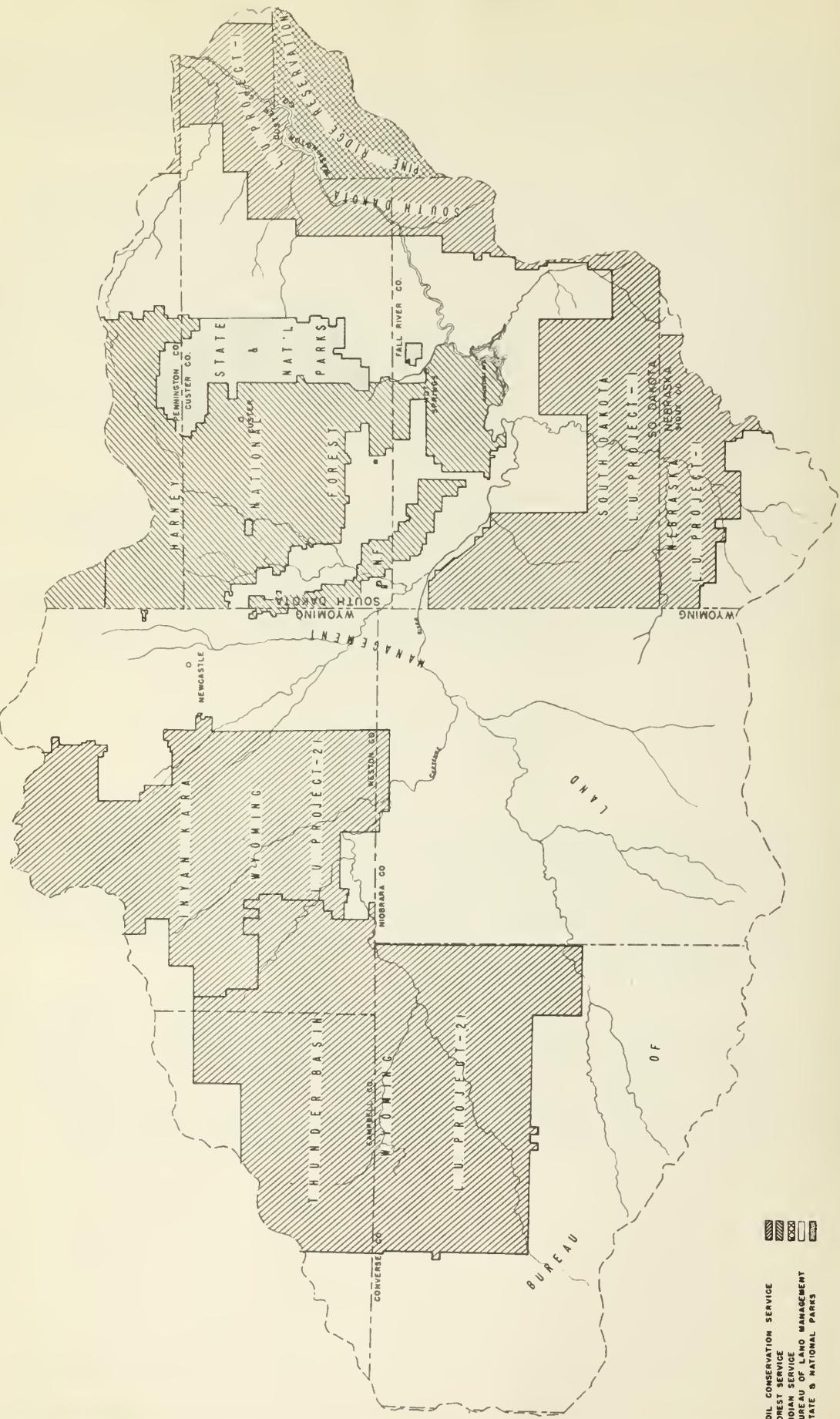
The reconnaissance field examinations and surveys were made by L. A. Merryfield, Range Conservationist, who also assembled and prepared the report. J. Elliot Hall and Harold T. Tysk, Land Economists, reviewed and edited the report, while the map was prepared under the supervision of William C. Anderson, Engineering Draftsman. The study in all its aspects was under the direction of R. D. Nielson, Land Economist in Charge of Missouri Basin Studies, Bureau of Land Management, Region III, Billings, Montana.

PURPOSE AND SCOPE

This report presents a preliminary analysis of the physical and economic features of the Angostura area and the various land management programs operating within the area. General information was developed regarding the location and extent of the public domain lands and the resources thereon, and their inter-relationships with other land management programs--this being a step in furtherance of the departmental plan for the comprehensive development of resources in the Missouri River Basin.

The scope is limited to assembly of information sufficient to make definite recommendations which will serve as a future guide in carrying out detailed land classification and inventory studies of the public domain lands. The principal problems relating to the public domain are discussed. The four sub-areas requiring further investigation are delineated, as a guide in carrying out more complete and detailed surveys which will follow this preliminary study.

MAJOR LAND MANAGEMENT ACTIVITIES WITHIN ANGOSTURA AREA



SOIL CONSERVATION SERVICE
FOREST SERVICE
INDIAN SERVICE
BUREAU OF LAND MANAGEMENT
STATE & NATIONAL PARKS

SUMMARY

The Angostura area comprises approximately 11,314 square miles, located in the Cheyenne River Basin in east central Wyoming, the southwestern corner of South Dakota, and the northwestern tip of Nebraska. It embraces all of that portion of the Cheyenne River watershed above the mouth of Rapid Creek in Pennington County, South Dakota.

The most pronounced physiographic features of the area are the Black Hills and the rough granite peaks located in the northeastern portion of the area, where elevations may exceed 7,000 feet. To the west and south are rolling broken prairie lands--the lowest elevation of which is 2,900 feet, situated in the northeastern portion of the basin, where Rapid Creek joins Cheyenne River.

At the foothills and along many of the streams, the soils may be fertile and productive, which is in contrast to the nearly sterile soils in the White River formations and in the sections termed as the "Badlands." The climate of the area is considered to be semi-arid, with an average rainfall varying from about 12 inches in Campbell County, Wyoming, to more than 24 inches in the Black Hills. Normally, about 77 percent of the annual precipitation falls during the growing season. The area experiences wide seasonal ranges in temperatures, with minimum and maximum varying from 49 degrees below zero at Dull Center, Wyoming to 117 degrees above at Rochford, South Dakota.

Agriculture is the predominant industry, with principal utilization of the land resources being centered around the production of range livestock. Range lands make up the bulk of the total acreage in the area and are generally used for spring, summer, and fall livestock grazing. However, a considerable quantity of dry-land wheat is harvested in the region--most commonly in Fall River, Pennington, and Custer Counties, South Dakota, where the seasonal and annual precipitation is more favorable for this type of enterprise. Along many of the streams, irrigation is commonly practiced--mainly for the production of forage crops for feeding livestock during the winter.

The area is sparsely populated, with a density of less than two persons per square mile. Only two towns, Newcastle, Wyoming and Hot Springs, South Dakota, are classified as "urban" by the Bureau of the Census. Fifty-five smaller communities are also located in the area, which is well served by cross-country roads and highways.

Private lands comprise 64 percent of the total area--the remaining 36 percent being in state or federal ownership. The lands under the jurisdiction of the Bureau of Land Management are generally comprised of small, scattered tracts that total about 4 percent (299,112 acres) of the gross acreage in the Angostura area.

The public domain tracts are most heavily concentrated in the north central and western portions of the area, where they often comprise as much as one-third of all lands. In relation to the watershed problems in the drainage area tributary to Angostura Dam, these public domain lands are especially sig-

nificant, due to their inherent poorer character and susceptibility to erosive forces. Other no less significant problems relating to the public domain are the need for examination and classification of lands withdrawn for public water reserves and stock driveways, in order to determine if they are serving the purpose for which they were originally withdrawn; mineral examinations of the public domain are needed in some areas to clear land titles; cadastral resurveys and remonumentation of public domain lands are needed in portions of the area; and there is need for complete factual information on all public land resources, including forage, timber, watershed, recreation and wildlife, in accordance with the multiple use principles and for the highest public interest.

Detailed sub-area reports to follow will indicate the most appropriate land programs to be followed in the four proposed sub-areas described in this report. Such detailed reports will indicate in what manner the various tracts can best be utilized for the public benefit; either by being included as an integral part of a sound land management program to be administered by this Bureau, or by other federal and state agencies; or by being disposed of to private interests, where such disposition is found to be not inconsistent with conservation principles and not disadvantageous to the national welfare.

PHYSICAL FACTORS

Location and Size

The Angostura area embraces the drainage basin of the Cheyenne River in east central Wyoming, a small portion of northwestern Nebraska, and that part of southwestern South Dakota above the mouth of Rapid Creek. This area includes all of Custer County and portions of Fall River, Pennington, and Washington Counties, South Dakota; part of Sioux County, Nebraska; and portions of Niobrara, Weston, Campbell, Converse, and Natrona Counties, Wyoming. The length of the basin in an east-and-west direction, is about 175 miles, and the maximum width is about 100 miles. Roughly oval in shape, the report area is bounded on the north by the Rapid Creek and BelleFourche River watersheds, on the west by the Powder River Basin, and on the south by the North Platte, Niobrara, and White River Basins.

From its headwaters in northwestern Converse County, Wyoming, the Cheyenne River flows in an eastward direction approximately 150 miles to the Angostura Reservoir in Fall River County, South Dakota; then continues in a northeasterly direction for approximately 70 miles to where Rapid Creek joins it from the west, which forms the northeastern boundary of the area.

As depicted on the map which forms a part of this report, the Angostura area comprises approximately 11,314 square miles, of which 63 percent is in Wyoming, 33 percent is in South Dakota, and 4 percent is in Nebraska. About 80 percent of the entire area lies tributary to the Angostura Reservoir, and this portion of the watershed contains approximately 9,100 square miles. Nearly 99 percent of the lands administered by the Bureau of Land Management lie tributary to the Angostura Reservoir.

Physiography

The area is characterized on the west by rolling hills and plains, interrupted in many places by extensive badlands, to more rugged and mountainous sections along the east and northeast portions. It includes parts of the Missouri Plateau and the Black Hills division of the Great Plains province.^{1/} The southwest portion of the region is characterized by smooth hills, resulting from the erosion of a formation of uniformly composed soft Pierre shales, which occur in this area in thicknesses ranging from 100- to 400 feet. Here and there, however, sharp crested buttes, capped by remnants of overlying sandstone which has resisted the erosion, rise above these hills. In places along the Cheyenne River and its tributaries, the hills give way to a sharper and much more rugged terrain, and here the stream channels may be cut to depths in excess of 200 feet.

The portion of the drainage basin west of the Black Hills and extending into Weston County, Wyoming, and that portion south of the Black Hills extending well into Custer County, South Dakota, consists of a series of valleys separated by steep-sided ridges, which are a part of the Black Hills Division of the Great Plains Province.

^{1/}Fenneman, N. M., Physiography of Western United States. McGraw-Hill Book Company, 1931.

The elevation of the area ranges from 2,900 feet where the Cheyenne River joins Rapid Creek in the extreme northeastern portion of the basin, to elevations of over 7,000 feet at the head of Bobcat and Battle Creeks, north of the town of Custer in the Harney National Forest. Approximately 5 percent of the area lies at elevations less than 3,000 feet above sea level; over 50 percent is between 3,000 and 4,000 feet in elevation; 40 percent is from 4,000 to 6,000 feet; and the remaining 5 percent exceeds 6,000 feet above sea level.

The principal streams entering the Cheyenne River below the Angostura Dam in South Dakota are Spring Creek, Battle Creek, Grace Coolidge Creek, French Creek, and Fall River. The main drainages which enter the Cheyenne River above the Angostura Dam are Horsehead and Hat Creeks, which rise in Nebraska; Red Canyon and Hell Canyon, which rise in the Harney National Forest, South Dakota; and Beaver, Stockade, Lodge Pole, Crazy Woman, Lance, Niobrara, Twenty Mile, Lightning, Box, Dry, Dryfork, Antelope, Thunder and Porcupine Creeks, all of which rise in Wyoming.

Geology

Formations within the Angostura area consist of sedimentary, igneous and metamorphic types. The Missouri Plateau Division is underlain by a sequence of sedimentary rocks covering a wide range in age; however, except where the Black Hills uplift occurs, the rocks consist almost entirely of sandstone and shales.^{1/} Great quantities of petrified wood are found on the hills around Hot Springs, South Dakota; and, in and around the many caves in the Black Hills vicinity, variegated quartz, colored granites and many other beautiful rock specimens occur. These are widely collected by tourists, souvenir hunters and students of geology.

The Black Hills Division is a dome-shaped uplift pushed up above the relatively flat areas of the Pierre shales, and was called "Pahasapa" by the Sioux Indians, because in the late sun, it looked like "Hills of Shadow." These hills run elliptically north and south, the southern third lying within the north central part of the Angostura area. Proceeding inwardly from the outer edge of the Black Hills, there are encountered four successive topographic divisions: The Hogback Ridge, the Red Valley, the Limestone Plateau; and, in the center, the Crystalline Peaks.

The Hogback Ridge rises to a height of 6,000 feet in an elliptical barrier around the hills and is best characterized by "The Needles" in the Harney Peak country in Custer County, which is a majestic example of Nature's granite sculpturing. The mountain streams have cut through the Hogback at several points, and most of the highways and roads follow these canyons and valleys, to enter the broad areas of the Red Valley. This valley, red in appearance due to the Spearfish formations of red shales and intercalciated white gypsum, averages about two miles in width, and encircles the hills. The red shales are most conspicuous around Hot Springs and between there and Edgemont, where they lend a beautiful contrast to the picturesque scenery of this part of the Black Hills. Rising above the red beds are the limestone plateaus, their once level patterns now cut and broken by canyons, small valleys, coulees and washes. The center of the Black Hills is a core of massive granite and related intrusive rocks.

^{1/}Fenneman, N. M., Physiography of Western United States. McGraw-Hill Book Company, 1931.

TOPOGRAPHY WITHIN ANGOSTURA AREA

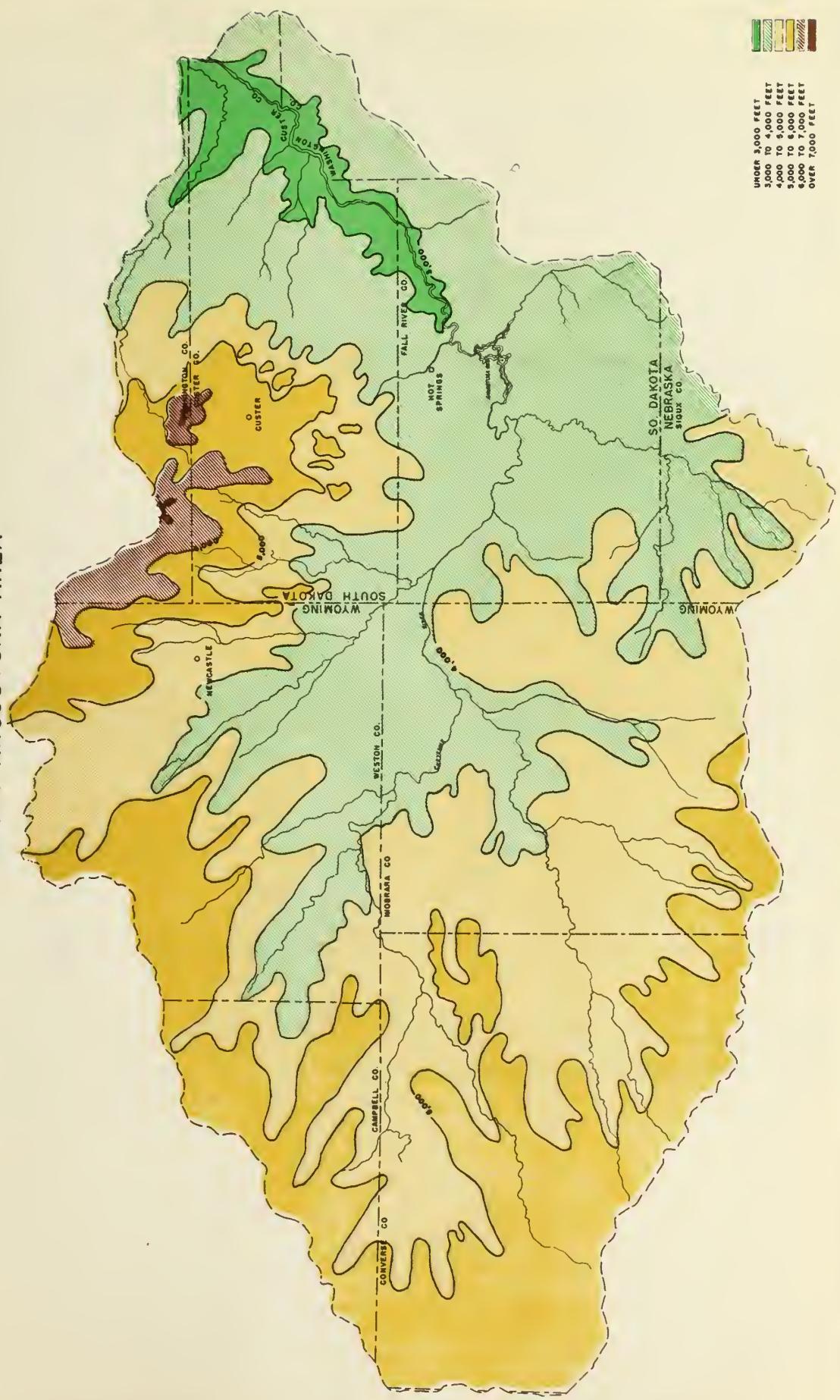


Table 1.- Climatological Data of the Angostura Area 1/

State, County and Station	Average Frost-free Period (days)	Temperature		Precipitation			Growing Season (inches)	Annual (inches)
		Maximum °F	Minimum °F	Maximum (inches)	Minimum (inches)			
<u>Nebraska</u>								
Sioux County								
Harrison 2/	129	107	-35	26.75	17.01	16.01	19.06	
Sheep Creek Camp	128	109	-36	23.90	13.13	12.37	16.16	
<u>South Dakota</u>								
Fall River County								
Ardmore	143	111	-35	27.93	14.59	12.29	16.01	
Hot Springs	146	114	-43	29.60	16.39	13.89	18.89	
Oelrichs	141	115	-44	31.07	14.48	14.99	19.17	
Custer County								
Custer	118	103	-41	29.97	13.66	14.47	18.16	
Elk Mountain	115	101	-33	28.47	12.39	12.09	16.29	
Hermosa	137	109	-44	29.83	11.69	14.94	18.31	
Pennington								
Deerfield 2/	106	113	-41	26.83	12.43	14.47	18.17	
Farmingdale 2/	126	115	-38	23.86	15.59	14.20	17.64	
Rapid City 2/	157	106	-34	24.68	19.99	14.56	18.36	
Rochford 2/	101	117	-39	26.30	16.55	15.27	20.31	
<u>Wyoming</u>								
Campbell County								
Echeta 2/	108	109	-46	17.60	8.47	10.99	16.43	
Gillette 2/	141	112	-40	19.40	7.90	10.23	14.47	
Rocky Point 2/	131	109	-45	21.02	8.65	11.99	17.69	
Converse County								
Douglas 2/	131	108	-43	19.40	6.35	9.87	13.91	
Dull Center	137	112	-49	20.01	9.04	11.98	15.17	
Ross (near)	132	109	-40	21.07	5.36	8.56	11.47	
Niobrara County								
Lusk 2/	122	108	-35	23.02	7.13	10.93	14.55	
Spencer	139	107	-38	19.40	7.01	10.87	14.48	
Kirtley (near)	126	110	-35	21.76	6.93	12.67	16.59	
Weston County								
Hampshire	134	110	-36	19.40	6.18	9.14	15.56	
Newcastle	137	111	-37	20.96	7.63	11.56	15.93	
Upton	110	105	-45	21.56	9.03	11.84	16.68	

1/ Compiled from Climatological Data, U.S. Department of Commerce, Weather Bureau, 1947

2/ Stations located outside report area, but data is applicable

Climate

All of the area lies west of the 100th meridian in a semi-arid region where the average precipitation is low, with considerable variance in the amount and in the seasonal distribution. The average annual precipitation is approximately 16 inches, of which about 75 percent usually falls during the growing season. (See Table 1) The average growing season for weather stations within or near the area ranges from 101 days at Rochford in South Dakota to 157 days at Rapid City, South Dakota. Ordinarily, the frost-free period is sufficient for the production of hay and small grains.

The area is subjected to wide variations in temperatures. Heavy snow storms, blizzards, and prolonged cold spells, particularly in the open plains portions, are common during the winter months. Although the frost-free period is shorter in the mountainous sections, the temperatures are usually not as severe or as variable as those in the plains areas mentioned above.

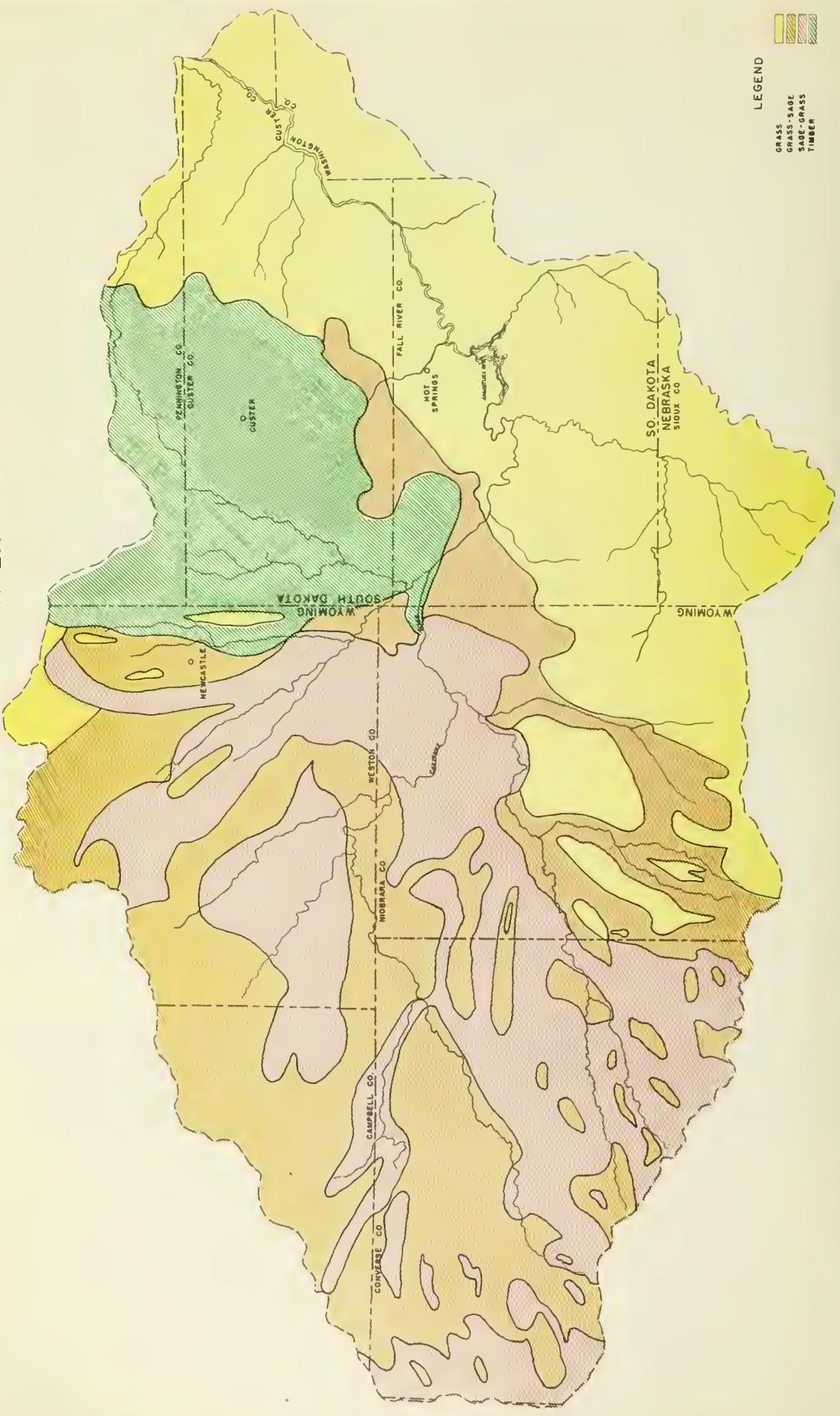
Vegetative Cover

The greater part of the report area consists primarily of range lands, and the natural vegetative cover is predominantly a short grass type--the principal species of which are blue grama, niggerwool, western wheat grass, slender wheat grass, June grass, Sandberg bluegrass, and three awn. Buffalo grass is found in the eastern portion of the basin, while in the Wyoming portion, most of the grazing land has a sage brush aspect, in which big sage appears to be the dominant vegetation, often comprising 15 to 20 percent of vegetative composition. Other shrubs associated with big sage are valley sage, rabbit brush, yellow brush, horse brush, buck brush, wild rose, and buffalo berry. Along the tributaries and main streams are found willows, cottonwoods, green ash, service berry, chokecherry, and some scattered juniper.

Stands of timber, broken by mountain meadows, dominate the national forests. The principal species found in these timbered areas are western yellow pine and juniper, with occasional stands of Douglas fir and spruce. Small stands of western yellow pine and juniper are also found on public domain lands, especially on the western edge of Wyoming flanking the Black Hills, and in northwestern Nebraska. Posts, poles, mine props, and saw timber are harvested annually from these lands by local residents.

On the basis of a general reconnaissance made of the public domain lands lying within the Angostura area, it has been estimated that approximately 70 percent of the public lands are of a short-grass type, approximately 20 percent are primarily a sagebrush type, 7 percent are a coniferous type, and the remaining 3 percent are salt sage type, or barren and wastelands.

VEGETATIVE COVER WITHIN ANGOSTURA AREA



CULTURAL DEVELOPMENT

Population

The Angostura area is sparsely populated, having only 20,706 inhabitants in 1940, according to adjusted figures of the Bureau of the Census. There has been some increase in population since 1940, particularly in Niobrara County, Wyoming, due to the activity in the oil fields. Only two towns in the area, Hot Springs, South Dakota and Newcastle, Wyoming; with populations of 4,083 and 1,962 respectively, were classified as "urban" in the 1940 census. Custer and Edgemont, South Dakota, with populations of 1,845 and 1,002, respectively in 1940, are the only other towns of any size within the area. There are 53 other towns and villages in the area with less than 300 inhabitants each.

Transportation

The Chicago Burlington & Quincy Railroad traverses the area in a northwesterly direction through the three states. Newcastle and Edgemont are the most important shipping points, servicing the central and northern portions of the area. The Chicago & Northwestern Railroad parallels the south boundary of the area through Chadron and Harrison, Nebraska, and continues west into Wyoming through Lusk and Douglas. This provides transportation facilities for the southern and western portions of the report area. A branch line from Chadron, Nebraska runs north through Buffalo Gap, Rapid City, Belle Fourche to Newell, South Dakota, to service the northeastern portion of the area.

The basin is served by U.S. Highways 16, 18, 20 and 85; by Wyoming State Highway 87; and by South Dakota State Highways 79 and 87. U.S. Highway 18 crosses Fall River County, South Dakota; and joins U.S. 85 in Wyoming. Numerous secondary state and county roads connect all the principal settlements with the main State and Federal highway system.

Industries

Livestock and crop production and oil and gas operations are the main industries in the area, both from the standpoint of persons employed and wealth produced. Industries of minor importance are forestry, recreation and mining.

The production of range beef cattle and sheep is the major industry, as indicated by adjusted records of the 1945 U. S. Agricultural Census. These records classify 96 percent of the lands in the basin as livestock-producing--91 percent being listed as pasture and range; 5 percent as wild and tame hay; slightly under 4 percent as other crops; and the fractional remainder as waste, water, roads, farmsteads, etc. From a standpoint of numbers of livestock, sheep exceed cattle, but based on an animal unit basis (5 sheep equals 1 cow), there are about three and one-half as many cattle as sheep. (See Table 2) The livestock industry is quite well-balanced as to available feed and forage supplies in relation to the numbers of livestock. This has been particularly true during the past decade.

In the Wyoming portion of the area, the cattle operations are conducted on a long-yearling or two-year-old basis, although there are a few operators who sell their calves to feeders at weaning time. Cattle are usually run on the open ranges, including the public domain lands, from the first of April to the latter part of November, and are then brought in to the home ranch pasture, calves weaned, and animals designated for sale--the latter being shipped or placed in feed lots. The foundation herds are wintered in the home pastures and are fed hay, grain, or concentrates, or a combination of all of these when weather conditions make it desirable or necessary.

Cattle operators in the South Dakota portion of the area run their stock in the foothills and on the forest from around May 31st to the last of September or the middle of October, and then bring them in to winter pasture and feed lots on the home ranches. The stock designated for sale is generally sold on the farm to local buyers or buyer representatives; although, in some cases, several small operators will combine their shipments and ship their stock to terminal markets.

Sheep operators herd their flocks on the open ranges year-long, bringing them in at weaning time in the fall, shipping the lambs and old ewes designated for sale, and taking the foundation stock back to the range. Concentrates, grain or hay is generally made available to take care of this stock when weather conditions make it necessary; however, there are a few operators who still risk grazing their flocks on the open range year-long without supplementary feed insurance.

The sheep and cattle business in the more intensively farmed areas in South Dakota is usually carried on with other farming activities, and is generally secondary to farming. Sheep are ordinarily in small barnyard flocks, taken care of at or near the farm residence. In some cases, though, several operators will group their small flocks together to form a band and hire a herder to care for them on the forest or on leased pasture.

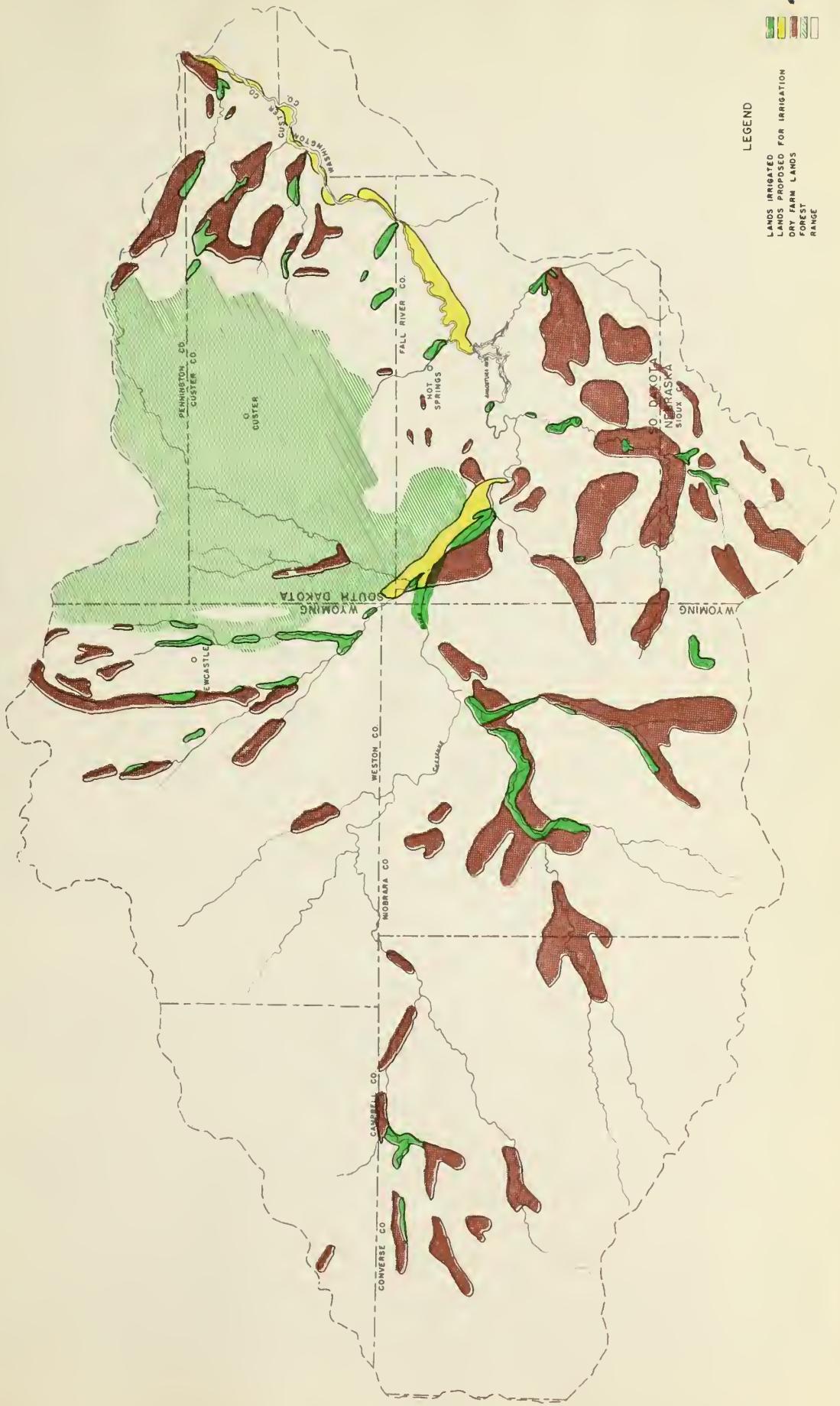
Table 2.- Class and number of livestock
and

Kind and acreage of crops in Angostura area, 1945

<u>Livestock</u>	<u>Number</u>
Cattle	359,000
Sheep	500,000
Horses	33,000
Hogs	15,000

<u>Crops</u>	<u>Acres</u>
Hay (wild and tame)	347,000
Oats	47,000
Corn	42,000
Spring Wheat	103,000
Winter Wheat	41,000
Alfalfa Seed	12,000
Potatoes	4,000
Rye	14,000
Barley	43,000
Total acres	663,000

LAND USE WITHIN ANGOSTURA AREA



According to the Bureau of Census figures for 1945, 683,000 acres, or 9 percent of the entire Angostura area, were cropland. (See Table 2) Tame and wild hay comprised 347,000 acres, which is about 52 percent of the total cropland; and spring wheat was produced on 103,000 acres, or about 15 percent. Other crops in order of importance were oats, barley, corn, winter wheat, rye, alfalfa seed, and potatoes. Substantially all crops are produced under dry-farming practices, with only a very small acreage lying adjacent to the streams under irrigation. The crop yields within the area are comparatively low--yields per acre for the counties concerned averaging as follows: hay, under one ton; oats, between 25 and 30 bushels; corn, from 10 to 15 bushels; spring wheat, under 13 bushels; winter wheat, less than 15 bushels, alfalfa seed, between 30 and 100 pounds; potatoes, from 30 to 220 bushels; rye, under 13 bushels; and barley, less than 30 bushels.

During the last decade, the trend has been toward an increase in the average size of the farms. The number of ranches in the area between the years 1940 and 1945 decreased from 5,228 to 4,475, while the average size of farms increased from 2,268 acres to 3,012 acres.

- - - - -

The area possesses untold wealth in the form of oil and gas resources, having produced, through the year 1946, approximately 82,000,000 barrels of oil from the seven known oil and gas structures. Royalties collected by the Federal Government from oil leases in 1945 totaled an estimated \$500,000. Due to the fact that there has been a good deal of activity in most of these fields since the above data were collected, both production and royalty figures have been considerably increased.

The oil activity is located almost wholly in Weston and Niobrara Counties, Wyoming; in the central part of the Upper Cheyenne River Basin. The principal fields are Lance Creek and Mule Creek in central and northeastern Niobrara County; and Osage, Mush Creek, Fiddler Creek, and Mule Creek in central and eastern Weston County.

Issuance of oil and gas leases on these lands, which are on the basis of competitive bids, and other administrative work connected therewith, is jointly under the jurisdiction of the Bureau of Land Management and the U. S. Geological Survey. Supervision over production and drilling is under the administration of the latter agency.

Leasing upon public domain lands, acquired lands, and restricted patent lands outside the known geologic structures are, except for the leasing provisions, administered in the same manner as those lands within. These leases are issued on a "first come, first served" basis to qualified applicants, rather than being competitively issued.

As of February, 1948, there were 852,342 acres within the Angostura area under oil and gas lease, all in the Wyoming portion, with the exception of 240 acres in Pennington County, South Dakota. (See Table 3) The 178,861 acres of public domain lands which are under oil and gas lease comprised approximately 64 percent of such lands in the entire area. As shown by Table 3, the Bureau of Land Management has issued the oil and gas leases not only upon these public domain lands but also on 615,848 acres of privately owned land and 57,633 acres of withdrawn lands in the area, on which the oil and gas leasing rights were retained by the Federal Government. Since the

Table 3.- Oil and gas leases on public, acquired, and restricted patent lands by states and counties in Angostura area, February, 1948 (acres)^{1/}

State and County	Public Domain Lands	Restricted Patent Lands	Title III Lands	Public Water Reserve Withdrawal	Total
<u>Wyoming</u>					
Niobrara	64,800	189,760	---	---	254,560
Converse	27,940	192,845	11,828	559	233,172
Weston	81,120	196,470	26,614	200	304,404
Campbell	4,761	36,773	18,432	---	59,966
<u>South Dakota</u>					
Pennington	<u>240</u>	---	---	---	<u>240</u>
Total Acres	178,861	615,848	56,874	759	852,342

^{1/} Includes public domain lands in which title to all surface and sub-surface rights remains in Federal Government, private-owned lands in which mineral rights were retained by Federal Government, and withdrawn lands or acquired lands in which mineral reservations are vested in the Federal Government.

above data were obtained, activity in the oil and gas business has increased considerably, as heretofore mentioned, and present estimates indicate that substantially all of the public domain lands are now under lease. The extent to which oil and gas exploration and development has occurred on private lands on which the mineral rights were retained in Federal ownership is known to have increased, but cannot be readily determined.

The forest lands, upon which are found mainly western yellow pine, juniper, and aspen, are primarily of value for the production of timber, watershed protection, recreation, hunting, fishing, and the grazing of livestock. Most of the commercial saw timber is within the national forests; however, there is some timber on public lands, particularly in the Wyoming portion of the basin adjacent to the Wyoming-South Dakota state line. Sawmills operate at Newcastle, Wyoming and Custer and Pringle, South Dakota; and, in addition, small mobile sawmills are in operation throughout the Black Hills area. Other scattered stands of timber are of local value for fence posts and firewood.

The Black Hills, principal mountain playground of the Middle West, provide unexcelled recreational facilities for thousands of vacationists. Points

of interest are Custer State Park, Wind Cave National Park and Game Sanctuary, Jewel Cave and Fossil Cycad National Monuments, Harney National Forest, and the Black Hills National Forest. The world-famous Mt. Rushmore Memorial lies northeast of the town of Custer, and there are many natural caves scattered throughout the Black Hills region. Well-stocked parks and game sanctuaries provide refuge for herds of buffalo, antelope, deer and elk, as well as limited numbers of mountain sheep and bear, many small game and fur-bearing species, wild fowl, and native song birds. Most significant wild life outside the Black Hills are antelope--virtually all of the Wyoming sector of the Angostura area being ranged by large herds of this species. It is estimated that about one-fourth of the state's total antelope population is located here.

Custer and Hot Springs, South Dakota, geographically located to serve as southern entrances to the vacation spots previously listed, and the latter town is of additional importance as a health resort, since it is the site of a group of excellent mineral hot springs. It was the first vacation resort in the Black Hills, possessed fine hotels and other facilities to match the hot springs; and, as such, attracted many historically-famous figures in the late 1800's and early years of the present century. Although such activities have dimmed somewhat in recent years, the facilities are yet available, and it is still a town of significance in the Black Hills area.

From a mineral standpoint, sub-bituminous coal or lignite is the foremost mineral resource of the Angostura area. Although principal deposits are found in the Gillette Field, with an estimated 15 billion ton reserve extending from Gillette to Newcastle, Wyoming, other smaller coal mines are also operated within the area. Small gold, silver and copper mines, at present unproductive, lie in the area. Rare earth minerals such as caesium and lanthanum, and deposits of lithium-bearing pegmatites are found in Custer and southern Pennington Counties in South Dakota. Deposits of limestone and gypsum are located near the lithium deposits. In the Dakota-Lakota sand series, there is a large amount of excellent building stone. Many stone quarries are presently being operated--the largest one the Evans Quarry near Hot Springs.

Bentonite is being produced in large quantities from the Upton region in southern Weston County, Wyoming. Two plants at Upton are shipping 500 tons per day, and another at Clay Siding ships about 140 tons daily. The most valuable beds are being rapidly mined out; but, as extensive research is now being conducted, it appears that the immense deposits of low grade bentonite will later be valuable.

LAND OWNERSHIP

The Angostura area comprises about 11,314 square miles, of which 4 percent is in Nebraska, 33 percent in South Dakota, and 63 percent is located in Wyoming. Privately owned lands are the principal class of land ownership in the area, and total 7,240 square miles, or 64 percent of the gross area. Of the remaining land in the basin, about 11 percent is within Land Utilization Projects under the administration of the Soil Conservation Service; 10 percent is within national forests under the administration of the U. S. Forest Service; 10 percent is state school and county lands and state parks; 4 percent is public domain under the administration of the Bureau of Land Management; while the remaining 1 percent is in national parks and monuments, under the administration of the National Park Service; Indian Reservations, under the administration of the Indian Service; Reclamation withdrawals, administered by the Bureau of Reclamation; and lands withdrawn for Battle Mountain Sanitarium Reserve, near Hot Springs, South Dakota.

Table 4 lists the acreages of the various classes of land ownership within the Angostura area by states and counties, and the accompanying map depicts the locations of these various classes.

LAND MANAGEMENT PROGRAMS

There are numerous Federal and State land management programs in the Angostura area, all of which are more or less inter-related to the over-all Missouri River Basin Development Program. A general analysis of the public domain is required to determine the relationship of such lands with other lands and water resource development programs. The map which forms the appendix to this report shows the location and extent of the various management programs.

Bureau of Land Management

There are 299,112 acres of public domain land within the area under the administration of the Bureau of Land Management. Of this acreage, 281,336 acres are public domain land; 11,385 acres are withdrawn for stock driveways; and 6,391 acres are withdrawn for public water reserves. Most of the public water reserves (5,911 acres) are located within the exterior boundaries of the Thunder Basin Land Utilization Project in Wyoming, which is administered by the Soil Conservation Service.

As shown on the map mentioned above, the public domain lands are scattered throughout the area, and generally consist of comparatively small tracts. Ninety-four percent of the lands administered by the Bureau of Land Management are located in Wyoming. The lands in Nebraska and South Dakota comprise less than one percent of the gross area in those two states, while in Wyoming they comprise six percent of the state's total area. Excluding the large area within the Thunder Basin Land Utilization Project area, which is administered by the Soil Conservation Service, the public domain lands comprise approximately ten percent of the gross area in Wyoming.

Table 4. - Classification of land ownership within the Angostura area by states and counties, 1949 (acres). ^{1/}

Bureau of Land Management, Reg on III, Billings, Montana; compiled from records of various county, state, and federal agencies.

2/ Only partially within report area.

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Acres 1,000 acres of private land in Crook County.

A general reconnaissance of the area indicates that substantially all of the public lands are primarily suitable for grazing and forestry; however, some of the lands may be needed in connection with other management programs in the area. Virtually all of the public domain lands are leased for grazing purposes, under the provisions of Section 15 of the Taylor Grazing Act. This section of the Act provides that livestock operators owning or controlling lands adjoining the public domain be given a preference right to lease. The grazing leases are ordinarily for a period of ten years; but, if the land use is not in compliance with the provisions of the lease, are subject to cancellation. Seasons of use, number of stock, and other range management practices are prescribed in the lease terms.

Indian Service

There are 83,120 acres of land under the general jurisdiction of the Indian Service within the exterior boundaries of the Pine Ridge Indian Reservation. These lands, in the extreme eastern portion of the area, are located in Washington County, South Dakota. They are utilized mainly for grazing and haylands, with small acreages cultivated to crops lying along the principal drainages.

National Park Service

The National Park Service administers Wind Cave National Park, Jewel Cave, Fossil Cycad, and Badlands National Monuments, Custer Recreational Demonstration Area, and Mt. Rushmore National Memorial. These parks and monuments total 43,675 acres; and, except part of Badlands National Monument which lies outside, all are within the Angostura area.

Bureau of Reclamation

Angostura Dam of the Bureau of Reclamation is located about ten miles south of Hot Springs, near the mouth of Red Canyon on the Cheyenne River. Intercepting a drainage area of about 9,100 square miles, the runoff consists of flash floods from summer rains and spring floods from melting snows. Angostura Reservoir, created by the dam, will provide a maximum storage capacity of 220,000 acre feet; of which 68,000 acre feet provides for diversion elevation, silt control and recreation; 92,000 acre feet for irrigation; and 60,000 acre feet for super storage.

Water stored in the Angostura Reservoir will provide for the irrigation of approximately 16,000 acres adjacent to the Cheyenne River in Fall River and Custer Counties of South Dakota. Most of the irrigable area lies south of the river, comprising a narrow strip of terraces and river bottoms extending along its course, and it is expected that the principal crops to be irrigated will be alfalfa, potatoes, corn, and small grains.

The Edgemont Irrigation Project is the only other water development within the Angostura area proposed by the Bureau of Reclamation. This dam and reservoir will be located along Beaver Creek, in the extreme southeastern portion of Weston County, Wyoming, about twelve miles northwest of the point where it empties into the Cheyenne River. The reservoir will store 45,000 acre feet of water for the irrigation of 8,000 acres of land, located principally in South Dakota adjacent to the Cheyenne River. The reservoir will also provide for flood and silt control.

Forest Service

Forest lands in the two national forests in the Angostura area total 673,109 acres, constituting nearly all of Harney National Forest and about 25,000 acres of the Black Hills National Forest. With the exception of 3,989 acres in Weston County, Wyoming, the forests are located in Fall River, Custer and Pennington Counties in South Dakota. About 75 percent of this gross acreage within the exterior boundaries is administered by the Department of Agriculture, and the remainder is owned by state, county, and private interests.

Soil Conservation Service

There are three Land Utilization Projects in the area which are under administration of the Soil Conservation Service, namely: Thunder Basin Project WY-LU-21, in Converse, Campbell, Niobrara, and Weston Counties, Wyoming; South Dakota Land Utilization Project SD-LU-1, in Pennington, Custer, and Fall River Counties, South Dakota; and Nebraska Land Utilization Project NB-LU-1, in Sioux and Dawes Counties, Nebraska. Boundaries of each of these projects are outlined on the map accompanying this report.

These projects were established under the provisions of Title III of the Bankhead-Jones Farm Tenant Act of July 22, 1937, whereby the Secretary of Agriculture is authorized and directed "to develop a program of land conservation and land utilization, including the retirement of lands which are submarginal or not primarily suitable for cultivation, in order thereby to correct maladjustments in land use and thus assist in controlling soil erosion, reforestation, preserving natural resources, mitigating floods and to effectuate the program. He is authorized to acquire by purchase, gift or devise or by transfer from any agency of the United States, submarginal land and land not primarily suitable for cultivation, to protect, improve, develop, and administer any property so acquired."

From the standpoint of size, control, and pattern of ownership, the Thunder Basin Project is probably the most important. The gross acreage of this project is 1,044,376 acres, of which 139,034, or 13 percent, is withdrawn Public Domain; 74,130, or 7 percent, is Relinquished Homestead Entries; 5,911, or 1 percent, is Public Water Reserve withdrawals; 244,071, or 23 percent, is Title III, Bankhead-Jones purchased lands; 63,776, or 6 percent, is state land; and, 517,454, or 50 percent, is privately-owned land. The project area is used primarily for the production of livestock and livestock feed which is consumed in the area. Although some fencing and seeding is contemplated; generally, the range improvements and developments are sufficient to permit proper distribution and use.

The Inyan Kara Cooperative Grazing Association, a non-profit organization, has established a 345,000 acre grazing district within WY-LU-21, the bulk of which is situated in the southwestern portion of Weston County. The Association leases State and Federal lands, as well as any private lands which may be available, and allocates grazing privileges to members of the association. All public domain in the district is leased under Section 15 of the Taylor Grazing Act, either to the association or to individuals operating in the area.

Land Utilization Project SD-LU-1 comprises an area aggregating 696,730

acres in Pennington, Custer and Fall River Counties. Privately-owned lands total 386,686 acres; 7,080 acres are state lands; and 302,964 acres are Title III acquired or purchased lands. For administrative purposes, the project is divided into two units--one with headquarters at Hot Springs, and a Badlands sector, with headquarters at Wall.

Land Utilization Project NB-LU-1 contains 148,610 acres. Of this amount, 77,210 acres are privately owned; 4,960 acres are state lands; 66,080 acres are lands purchased under Title III of the Bankhead-Jones Act; and 360 acres are public domain lands. The project is divided in two sections for administration--the Sugar Loaf and the Pine Ridge Soil Conservation Districts, both with headquarters at Chadron, Nebraska. About 95 percent of this project area is classified and used as grazing lands; the remainder is hayland, cropland, forested lands, and recreational lands.

Substantially all federally-owned land in these land-use projects was acquired under Title III of the Bankhead-Jones Act during the 1930's. They are lands that were under various types of ownership and that were purchased during a period when they were considered sub-marginal for crop production purposes. At the time, the lands were also regarded as a serious menace from the standpoint of soil erosion; however, favorable climatic conditions and good land management practices during the last decade have contributed to a marked improvement, and most of the soils are now stabilized with a satisfactory vegetative cover.

Department of Defense - Battle Mountain Sanitarium Reserve

An Act of Congress promulgated on March 22, 1906 withdrew the 3,040 acres of public land as a sanitarium for the use of the National Home for Disabled Volunteer Soldiers. Originally under the jurisdiction of the War Department, it was transferred to the Administrator of Veterans Affairs, by reason of the consolidation of the Veterans Bureau, the Bureau of Pensions, and the National Home for Disabled Volunteer Soldiers. On July 27, 1949, the Department of the Interior was advised by the Administrator of Veterans Affairs that "the land has been determined to be excess to the needs of the Veterans Administration." A bill was introduced and is now pending in the House of Representatives (H.R. 6863, 81st Congress, 2nd Session) to return to the public domain lands in this reserve for administration by the Department of the Interior under applicable public land laws.

Custer State Park

There are 101,680 acres of land within the Custer State Park under the administration of the South Dakota Game, Fish and Parks Commission. Most of the park area lies in Custer County, with a small acreage in Pennington County, lying southwest of the town of Keystone. As previously mentioned, this park supports a large number of buffalo, antelope, and deer, as well as numerous species of small game and game birds.

The public domain lands under the administration of the Bureau of Land Management constitute only slightly more than 4 percent of all lands in the Angostura area. However, in some areas the public lands are somewhat concentrated and comprise a higher percentage, particularly in the Wyoming portion of the drainage. The reconnaissance survey of these lands and general analysis of their relationship to other governmental programs in the area reveals numerous problems relating to the management, development, utilization and disposition of the public domain lands. Specifically, this preliminary study indicates that the following problems will require additional detailed studies to determine the extent to which they constitute a problem and the corrective measures needed to rectify or alleviate the situation.

Stock Driveway and Public Water Reserves

There are 11,385 acres of public domain land lying in Converse County, Wyoming, withdrawn for stock driveway purposes. Established many years ago to provide for the movement of livestock to and from winter and summer range areas and to provide access to railroad shipping points, these stock driveways form a part of the Orpha driveway, which extends from Ross, Wyoming, in the extreme northwestern portion of the area, to the shipping point at Orpha, Wyoming, on the Chicago, Burlington & Quincy Railway, west of Douglas, Wyoming.

Preliminary investigations indicate this driveway is necessary for the movement of livestock in the area, and it is apparently adequate for such purposes; however, available information is insufficient to determine the extent to which it is used. It appears that there is some need for improvement in the continuity of the driveway and for adjustments in location. Closer supervision is required to eliminate trespass during trailing and non-trailing seasons. Since this driveway also serves a portion of the North Platte River Drainage, the detailed study will also be correlated to the study of the driveway problems in that drainage.

There are 6,391 acres of public domain lands in the Angostura area withdrawn for public water reserves, nearly all in Thunder Basin Land Utilization Project in Wyoming. These withdrawals were executed to preserve for general public use and benefit unreserved public lands containing water holes or other bodies of water needed or used by the public for watering purposes. They were established many years ago when ranch and farm boundaries were indefinite and the range lands in some areas were used in common by various livestock operators. Available information indicates that changes in these ranch boundaries have, in some cases, resulted in individuals acquiring under one ownership or control, all lands adjoining and surrounding the lands withdrawn for public water reserves. Under these circumstances, the lands are not needed or are not being used for the purpose for which they were withdrawn. Detailed examination and classification is necessary to determine the need for the continuance of these withdrawals and the disposition or management required for those lands not needed for public purposes.

Erosion and Sedimentation

The erosion and sedimentation problem of the Angostura area not only applies to the public domain lands but to all other classes of land ownership. Very favorable precipitation during the last decade has resulted in a marked improvement in the vegetative cover of all lands in the area; which, in turn, has diminished soil erosion. In spite of this rather prolonged period of high precipitation, an undetermined amount of erosion is taking place.

Depletion of surface water runoff resulting from its impoundment in stock water reservoirs is apparently a problem of considerable magnitude, insofar as storage in Angostura Reservoir is concerned. Preliminary studies now being carried on by interested Interior Department Agencies will determine the extent of such depletion. The effect that these upstream reservoirs have on the problems of water depletion and sedimentation will be correlated with studies of other agencies, insofar as they relate to the public domain.

Available conclusive data regarding the sedimentation problem are not available; however, based upon preliminary investigations, sedimentation may cause the storage capacity of the Angostura Reservoir to become seriously depleted in 25 years. The public domain lands, while comprising only a small percentage of the whole basin, appear to be contributing to sedimentation in the Cheyenne River and its tributaries in a much higher proportion in relation to their land area than other lands in the basin. This is due to the fact that the public lands are the remnants of an almost century-long disposal program; and, of course, only the least desirable and most unproductive lands now remain.

Detailed studies of the public domain lands are necessary to determine their significance in the siltation of the Angostura Reservoir. Consideration will be given to corrective and control measures that are needed for public domain lands contributing to the silt problem. Investigations will be closely correlated to the current studies of the Bureau of Reclamation and the U. S. Geological Survey.

Administrative Problems

The Bureau of Land Management is charged with the responsibility of proper management and utilization of the public domain lands. Except for individual examination and classification of lands applied for under the various public land laws, no comprehensive resource inventory has been made of these public lands. To provide for the proper management and utilization of these lands, detailed inventories are necessary. Consideration must be given to the various multiple uses of these lands, such as grazing, watershed, wildlife, recreation, mineral, and timber. Increased demands for recreational purposes will undoubtedly arise for the public domain lands lying adjacent to the Angostura Reservoir. Other public lands in the area are also known to be primarily valuable for recreational and homesite purposes.

Detailed classification will reveal their suitability and contribution to the recreational resources of the area. Mineral examinations of some of the public lands are necessary to clear public land titles, to permit proper land use and to provide for the orderly and lawful exploitation of the mineral resource. In order to provide for the maximum utilization of isolated tracts of public lands in the area that are not valuable under continued public ownership, detailed classification is a prerequisite to their disposition to private interests under applicable land laws. There may be a need for cadastral resurveys of public domain areas where precise horizontal control is inadequate or entirely lacking. Detailed field studies will reveal the need for reestablishment and remonumentation of public survey corners in such areas. Cadastral resurveys will prove beneficial not only for the proper administration of the public lands and the development programs thereon, but will expedite location surveys made by other public land users and Federal agencies. The Bureau of Land Management is the only agency authorized by law to make these surveys and resurveys of public land.

The Thunder Basin Land Utilization Project of the Soil Conservation Service in the Wyoming portion of the Angostura area comprises over one million acres. This project is the most important land management program in the area, from the standpoint of land ownership and control. Substantially all of the public domain lands in the area lie adjacent to the lands within the boundaries of this project. The initial boundary lines between the land utilization project and the public domain lands was more or less arbitrarily established following county lines in some portions, ranch units in others and townships and section lines in some cases. (See map appendix). Executive Order #10046, dated March 25, 1949, transferred certain lands from the Department of Agriculture to the Department of the Interior and withdrew certain public lands for administration by the Department of Agriculture. This change in the jurisdiction of the lands in the area has undoubtedly solved some of the administrative and management problems of both agencies, but other adjustments may be required. The detailed study which follows will determine where and what changes will facilitate administration and improve the operating pattern in the area.

Substantially all of the public lands in the area withdrawn for public water reserves are contained within the boundaries of this land utilization project, and are presently under the administration of this Bureau. As previously discussed, a detailed examination and classification of the withdrawn lands will be necessary to determine whether they are needed for the purpose for which they were originally withdrawn.

From the standpoint of land ownership and control, the lands within the Harney National Forest in the South Dakota portion of the basin are next in importance to the Land Utilization project areas. A substantial part of the remaining public domain lands in the area in South Dakota lie adjacent to the Harney National Forest boundaries. In addition, approximately 20,000 acres of public land in a rather consolidated pattern are located in Weston County, Wyoming, adjacent to the Wyoming-South Dakota state line. These public lands adjacent to the Harney National Forest are

desired by the Forest Service in connection with their land acquisition program. Detailed studies will determine the physical and economic suitability of the public domain lands within the acquisition areas. These studies will in turn provide a sound basis for their future management or disposition consistent with the general public welfare.

PROPOSALS FOR DETAILED STUDIES

The Angostura area has been delineated into four sub-areas for the detailed studies that will follow. These sub-areas were delineated primarily upon the basis of problems peculiar to the area, amount and concentration of public land, and relationship to other adjoining drainage basins.

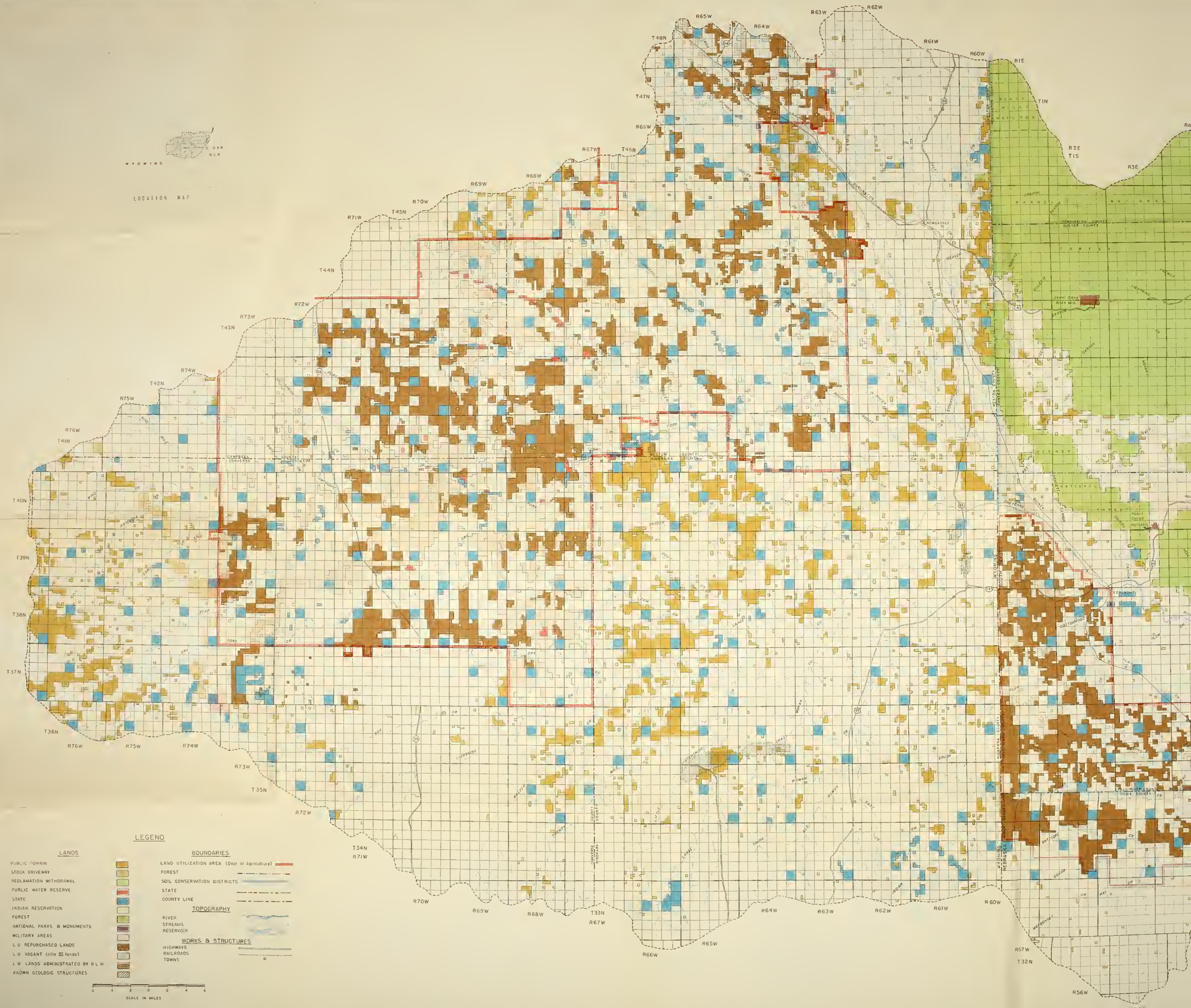
Sub-area 1 - This sub-area comprises all public lands within South Dakota and Nebraska. The public lands in this area comprise less than one percent of the entire sub-area and are scattered promiscuously throughout this portion of the basin.

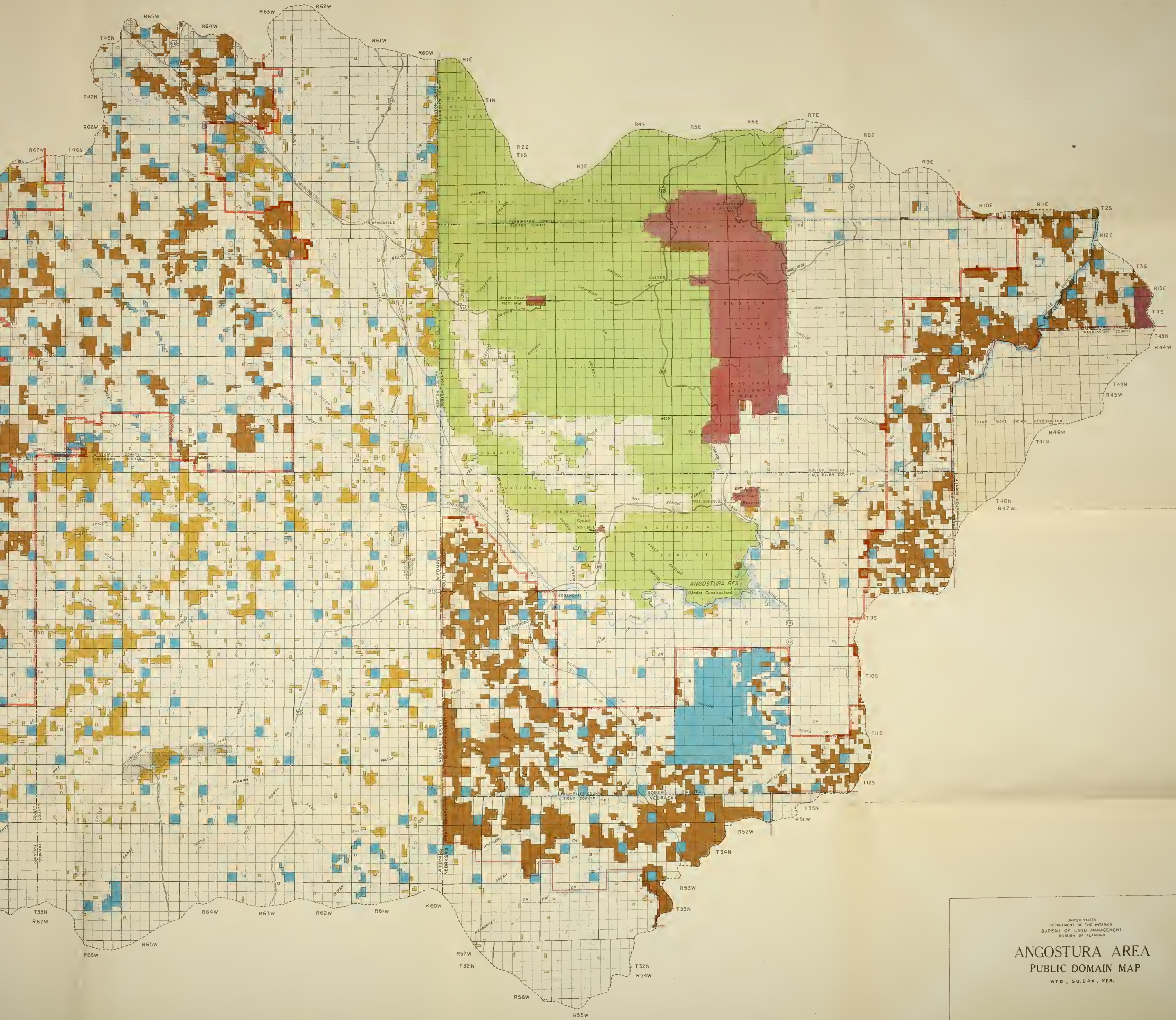
Sub-area 2 - Includes northwest Niobrara County and southeast Weston County, which lies contiguous to Thunder Basin Land Utilization Project. The public domain lands within this area comprise one-third of the entire area and reconnaissance survey indicates this area is highly significant from a standpoint of siltation and sedimentation to the Cheyenne River above Angostura Dam.

Sub-area 3 - Comprises public domain lands lying in northwest Converse County in the headwaters of the Cheyenne River. The public lands comprise about one-fourth of the total sub-area. This area lies adjacent to the Powder River and North Platte River Basins, where public domain lands are the dominant class of land ownership. Virtually all stock driveways in the Angostura area are within this sub-area.

Sub-area 4 - Includes the remaining areas in Wyoming, in which the public lands lie in a scattered and isolated pattern. The public lands comprise less than five percent of the entire sub-area. This sub-area includes the Thunder Basin Land Utilization Project, insofar as classification is required of the public water reserves.







UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
DIVISION OF PLANNING

ANGOSTURA AREA PUBLIC DOMAIN MAP

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